ASSESSING THE EFFECTIVENESS OF REDUCED PARKING REQUIREMENTS IN FACILITATING TRANSIT-ORIENTED DEVELOPMENT: A CASE STUDY OF 'PT AREAS' IN CAPE TOWN

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ABSTRACT

In Cape Town a mechanism, referred to as 'public transport areas' (PT areas), was introduced in 2014 to allow for the decreased provision of off-street parking in areas well-served by public transport. This mechanism was intended to not only reduce trip generation, but to also facilitate Transit-Oriented Development (TOD). To date the impact of the PT areas mechanism has not been systematically assessed. This paper reports on the results of an assessment of developer uptake of the PT areas offering, and outlines the implications for transport and land use. It concludes that substantial developable land has been saved in PT areas for more productive use, thus directly contributing to TOD. However, this has not been supported in turn by an improvement in the public transport system in most areas. It can be concluded that this mechanism can be an effective TOD tool, but that mechanisms should be put in place to measure its uptake, and its effect on reducing the number of private car trips.

1. INTRODUCTION

Kodukula and Sharma, writing for the international development agency GIZ (2011: 2), preface their handbook on parking management in developing cities by warning that "often, cars get more space to park than humans have to live in!". Expanding on this, as long as private vehicles retain their current dimensions, the parking bay as we know it is here to stay for the foreseeable future. The implication of this is that parking as a land use, under current conditions and into the foreseeable future, is as significant as the land uses which generate the trips by these vehicles. Parking is thus one feature which is equally a transport and land use feature. As Shoup (2017: 3), a leading thinker in moving from a technical to a strategic approach to parking provision and management, observes: "parking affects both transportation and land use."

This paper explores the potential for reducing the trend of the disproportionate amount of land being made available for parking versus more productive land uses, using an assessment of the uptake of Cape Town's 'public transport areas' (PT areas) mechanism as a case study. It aims to answer the question: *Recognising the current car-centric nature of the modern city (both in the Global North and South) on the one hand, and the sustainability and social equity imperatives on the other, can parking provision and management be used to support the restructuring of the city over time, in support of public transport and of transit-oriented development?*

Cape Town has implemented a parking reduction offering to developers, which applies to areas well-served by public transport. This paper will assess the uptake of this option, paying attention to its variable uptake in different types of centres across the city. It will quantify the uptake of the reduced parking offerings; analyse this spatially; and consider the implications of the findings for transit-oriented development in Cape Town. It will therefore contribute to the discussion on the role of reduced parking in contributing to a more desirable urban form (for social, environmental, and economic reasons), and the efficacy of this land use management tool in influencing the behavioural responses of both developers and travellers.

While it cannot be considered in isolation, the focus of this paper is on off-street parking attached to land developments, which is essentially privately provided parking. The paper does not present evidence of a relationship between reduced parking provision and reduced private vehicle trips in Cape Town: this is an area needing further research.

The rest of this paper is organised into five sections. The next section will provide a concise literature review of various factors that influence parking supply and demand. The next three sections then turn towards the local case study. Section 3 explains the PT areas mechanism which was developed and implemented by the city government. Section 4 sets out the research method used to assess the uptake and impact of this mechanism between 2014 and 2019, and section 5 sets out the results of the assessment. Section 6 then reflects on both the case study and international precedent and offers some conclusions and recommendations.

2. LITERATURE REVIEW

2.1 The New Paradigm on Parking

"Cars have many external costs, but the external cost of parking in cities may be greater than all the other external costs combined" (Shoup, 2017: 549). Shoup (2017) called for a paradigm shift in planning for parking in the late 1990s and early 2000s, addressing the over-provision of parking, and the masking of the true cost of parking through the subsidization of its pricing. This new paradigm was further developed, and popularized by Rye in GTZ's sourcebook for policymakers: see table below summarising the shifts. This new paradigm is central to this paper, although it recognises that in many instances, the new paradigm has not been fully embraced by city governments or private developers.

Table 1: Paradigm shift in parking policy

	OLD PARADIGM	NEW PARADIGM
Parking considered as	public good	commodity
Demand assumed	fixed/ inelastic	flexible/ elastic
Supply should	always grow	be managed in response to demand
Government regulations	set minimums and no standards	none / set maximums
Pricing maximises	utilisation	availability
Turnover encouraged via	time limits	pricing
Cost should be	bundled with goods	transparent to users

(Source: Rye, 2010: 22)

This paradigm shift has been influenced by mounting pressure for policy makers to respond to broader environmental imperatives. The 'sustainable mobility' approach developed by GIZ[1], first published in 2011, includes the actions: 'Avoid-Shift-Improve'. While these actions require multiple interventions, the management of parking can contribute to all three of these actions.

2.2 The Impact of Parking on Urban Form

Understanding the impact of transport provision on land use is not new, and has more recently been referred to as Transit-Oriented Development (TOD). It is the targeted intensification of land use at transit nodes and along transit corridors, to support transit use and more sustainable travel choices, with the land uses in turn benefitting from greater accessibility. TOD needs a strong and improving integrated public transport network and service which attracts investment in surrounding land to benefit from the increased accessibility of these locations.

"Parking policy is an important element of transit-oriented development (TOD). It shapes travel behaviour, community design, and development economics; it can improve the performance of both rail transit and TOD" (Willson, 2005:79). An important aspect of parking policy is managing parking supply. Parking supply has two roles to play in this mix as the terminal point of a trip: it requires space and related circulation space, thus putting downward pressure on development density; and if cheap and easily available, it discourages a shift to public transport, which is a prerequisite of TOD.

2.3 The Impact of Parking on Travel Behaviour

It has been demonstrated that parking demand can be reduced through travel demand management (TDM) measures such as pricing and reduced supply (Shoup, 1999; Willson, 2005). Theories of travel choice behaviour have been developed which guide the most appropriate measures. These theories include rational choice, which is rooted in the economic theory of utility maximisation, and the theory of planned behaviour, which identifies an initial decision-making process, informing behaviour which is then established as a habit. Although rational choice models have been criticised, it remains true that the cost of parking remains a strong determinant in travel choice. TDM requires habits to be broken through challenging the beliefs underlying the behaviour.

2.4 Responsiveness of Developers to Changing Travel Behaviour

Developers will respond to what their market demands, within the confines of local government bylaws and policies. On the one hand, they are bound by the expectations created by the old paradigm for ample, 'free' parking, in which they pass on the actual costs of parking to tenants, customers and ultimately to the 'non-parkers'. However, Willson (2005) also notes a willingness to change: especially in areas identified as TOD, especially if presented with examples which are working successfully.

[1] https://www.ledsgp.org/wp-content/uploads/2016/01/SUTP_GIZ_FS_Avoid-Shift-Improve_EN.pdf, Accessed 30/08/2021

3. PT AREAS MECHANISM IN CAPE TOWN

3.1 The PT Areas Concept

The City of Cape Town (CCT) has developed a mechanism to 'bridge the gap' between the old and new paradigms, reducing current minimum parking requirements in areas which are suitable for transit-oriented development, without enforcing maximum parking standards. According to the CCT, "PT areas invite reduced off-street parking provision in all land uses within demarcated areas, thus supporting public transport through enabling increased development intensity, development viability, and lower private vehicle trip generation." (City of Cape Town, 2019:i). The mechanism was first applied geographically in 2014, as an aid to simplifying the land development management process with respect to parking requirements in the Development Management Scheme (DMS), i.e., the local zoning scheme. The diagram below illustrates the concept: a PT2 area has a radius of 400 m from a well-functioning, multi-modal public transport facility. A PT1 'halo' extends an additional 400 m from the PT2.

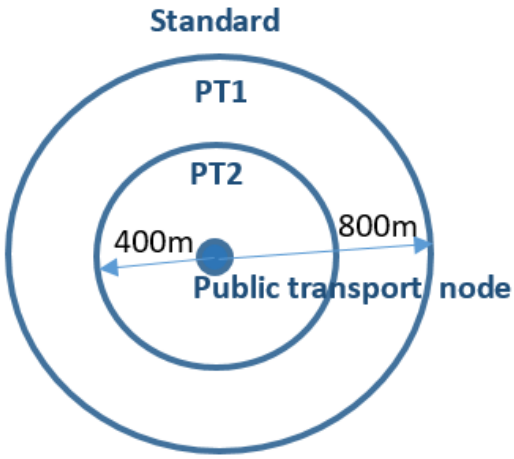

Figure 1: Diagrammatic representation of PT areas

3.2 The Application of PT Areas (2014-2019)

The application of the PT areas requires the DMS, which contains a table of parking requirements for all land use zones, across the three parking areas: Standard; PT1; and PT2. A table in the DMS entitled 'Minimum off-street parking requirements' stipulates the minimum required number of parking spaces for each type of land use for the three PT areas. The PT areas are defined (Municipal Planning Bylaw, 2015:146) as follows:

Standard areas: areas with standard parking needs, or where public transport is not specifically promoted or available.

PT1 areas: areas where the use of public transport is promoted, but where the City considers the provision of public transport inadequate or where the use of motor vehicles is limited.

PT2 areas: areas where the use of public transport is promoted and the City considers the provision of public transport good, or where the use of motor vehicles is very limited.

The initial application (in 2014) required an analysis of all fixed public transport stops (i.e., rail stations and the newly-built MyCiTi trunk station 'pods'). A tool was developed which ranked the following characteristics of every station according to:

- Availability of public transport or areas in which public transport improvements are promoted.
- Existing operational quality of public transport (in terms of frequency and capacity).
- The level of service (quality) experienced at stations and at precinct level (not available).
- The socio-economic characteristics of the surrounding area (indicated by car ownership levels) (City of Cape Town, 2016:6).

Since 2014, there have been subsequent corrections and additions based on planned rail and MyCiTi trunk stations. The resultant map (in 2019) is shown below.

(Source: City of Cape Town internal CityMap Viewer, accessed 15/08/2019)

Figure 2: The PT areas map

4. RESEARCH METHOD

4.1 Background Data: A Pilot Project

The lead author is an official in the City of Cape Town's Integrated Transport Planning Branch. In 2017 she was tasked with leading an interdisciplinary team to recommend

extending the ambit of the PT areas mechanism. She was required to do so without first assessing the uptake or the impact of the current PT mechanism. Only once the extended ambit had been developed and a new iteration recommended, could she turn to assessing the previous iteration, in the form of a pilot study of centres in Khayelitsha, Mitchells Plain, Wynberg, Claremont and Woodstock to Observatory.

There was no automated tool to extract data for the assessment, so she and her colleagues developed a manual method in which all building plans with parking implications approved during the study period (2014-2019) were analysed to extract the number of bays provided. This was compared with the number of bays required in the reduced minimum requirement, as well as with the minimum requirement had there been no PT area (i.e., the standard parking requirement). As there was no prior information on the quantum of data that would be generated per urban centre, nor the number of relevant building plan cases, a pilot study of just five urban centres was undertaken.

The pilot data extraction and collation process involved a series of steps through which a large 'universe' of all erven within PT areas was reduced to only those building plans with parking implications approved between 2014 and 2019:

Step 1: Identification of the pilot areas on GIS.

Step 2: Extraction from GIS of all erven within the PT1 and the PT2 areas in each pilot area.

Step 3: Extraction from online database of all erven and their approved building plans between 2014 and 2019.

Step 4.1: Extraction of all erven with parking implications to the building plan changes.

Step 4.2: Compilation of a 'capturing sheet' of all cases with parking-related data, and aggregation per PT area per pilot area.

4.2 Data Collection and Analysis

The pilot project tested the method, produced interim results, and provided lessons to improve the method when extended to PT areas across the entire city. The pilot method proved sufficiently effective to apply at scale, and the author's Manager agreed that she would complete the assessment in her capacity as a postgraduate dissertation student. It was agreed that the City would provide the cleaned data, and that she would analyse the data to complete the assessment. Three data sets were produced: PT2 areas (37 centres); PT 1 areas (45 centres); and the Cape Town Central Business District (CBD) overlay zone.

Several limitations were experienced with the data collection and analysis:

- Due to the high volume of cases in many areas, not all single residential plans were included. As each plan would potentially show an over- or under-supply of only one or two parking bays, these cases were excluded. This would be more significant in PT areas with large single residential areas, which are predominantly in PT1 areas of lower car ownership.

- In a few cases, sufficient data was not available on the plans, and these cases had to be excluded. While the cases would have been relevant, excluding them is unlikely to have significantly shifted the trends observed.

- Only the latest building plans were extracted: any earlier building plans (approved after 2014) were not captured. This was managed by recording the parking provided for the full development, where available.

- The author, in her capacity as an official, had to estimate the "standard parking requirement" using the DMS which was relevant at the time. While in most cases this was simple to apply, this may have resulted in small inaccuracies for more complex, mixed-use developments.

- Some areas produced small samples for the capturing sheets (with zero relevant cases in 31 areas). This could result in a skewing of the results when analysed at an individual PT area level.

- While Century City and the V&A Waterfront are both in PT2 areas which require zero parking, they have parking specifications related to their spatial development frameworks and related precinct plans. Both also rely on shared parking garages to meet parking requirements. However, some developments within these two precincts could be analysed, and the V&A Waterfront PT2 area also includes properties in Greenpoint.

- Many of the parking calculations resulted in fractions of a bay. While in reality these would either have been rounded up or down, when adding lists of results in Excel, these fractions were added. This could result in slightly more additional bays in the total in some areas.

5. RESEARCH RESULTS

5.1 Results for the PT2 Areas

Comparing the actual parking bay provision against the PT2 offering, there was a general over-provision in all the PT2 areas. However, the PT2 offering was significantly lower than the standard requirement, at 28%. Figure 3 illustrates that there was under-provision against the standard requirements. In total, 4 202 bays were saved in all the PT2 areas. This equates to 78 788 m^2 (7,8 ha) of developable land 'saved' for more productive land uses[2].

Major centres such as Woodstock to Observatory, Claremont and Bellville were outliers in this dataset. Woodstock to Observatory was the largest sample, with most developments matching the PT2 offering, and largely underproviding against the standard requirement. Claremont significantly overprovided against the PT2 offering, and largely underprovided against the standard requirement, as did Langa and Bonteheuwel on a smaller scale. Bellville provided no parking in its three developments.

[2] It was assumed that each bay required 18,75 m^2 including circulation space

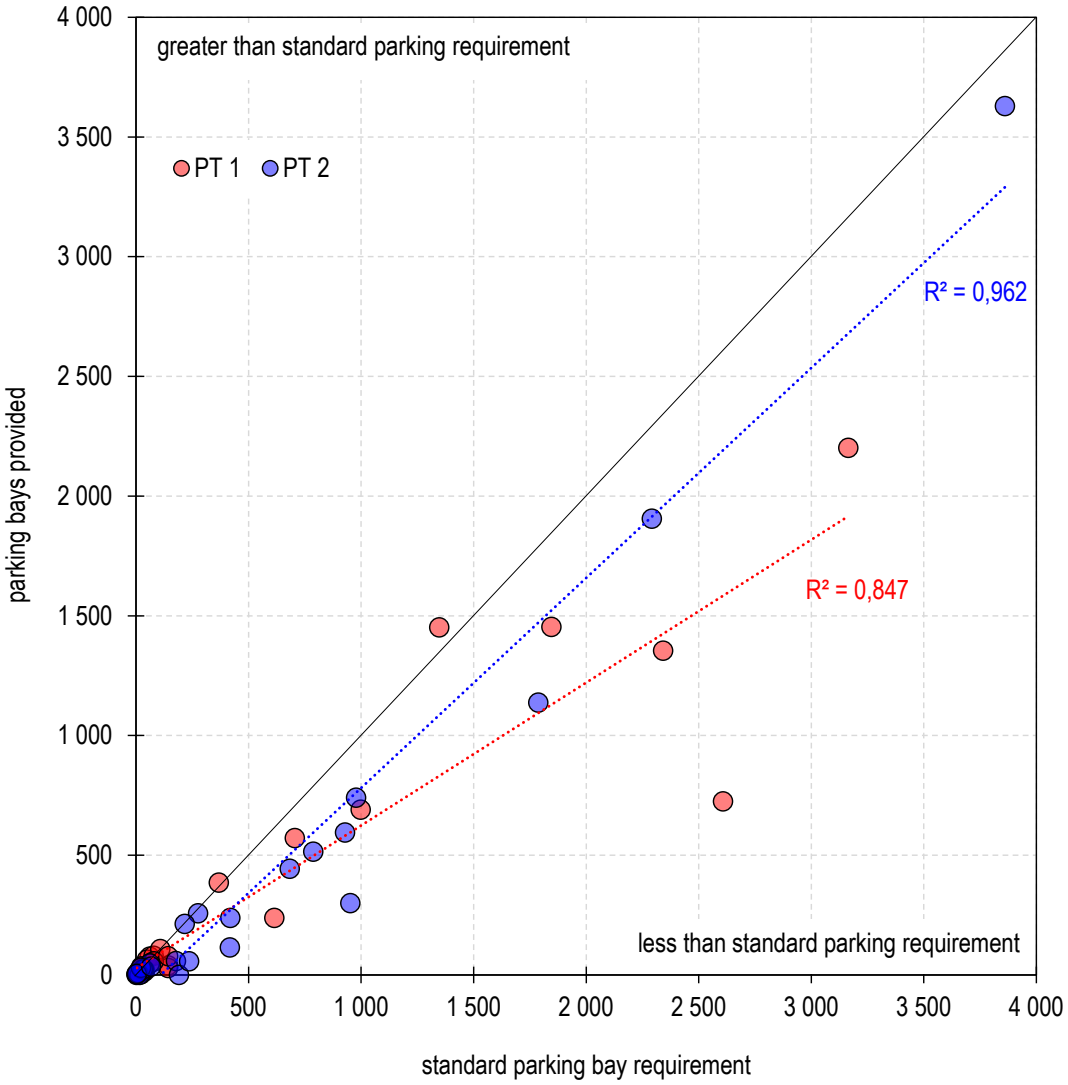

Figure 3: Relationship between parking bay provision and standard requirement in PT1 and PT2 areas

5.2 Results for the PT1 Areas

Comparing the actual parking bay provision against the PT1 offering, there was a general under-provision in all the PT1 areas (although most of the bays provided were in developments which overprovided). Figure 3 illustrates that there was significant under-provision against the standard requirements. In total, 5 460 bays were saved in all the PT1 areas. This equates to 102 375 m^2 (10,2 ha) of developable land 'saved' for more productive land uses.

Results were influenced by two big centres: Woodstock to Observatory, and Claremont, as well as significant student accommodation provided at Unibell. Most areas underprovided against the standard requirement. Unibell and Claremont underprovided in all their developments. Rondebosch, Woodstock to Observatory, and Langa to Heideveld had more mixed responses.

5.3 Results for the CBD

The results for the CBD overlay zone are far simpler because there is no standard parking requirement against which to compare the provision, because the area has a zero-parking

offering. There are also other factors which do not encourage the reduction in parking supply for multi-storey developments, such as a policy that parking is not included in the floor factor limit. There was evidence on some building plans of a recommended parking provision based on a traffic impact assessment (TIA).

Table 2: Parking provision in the CBD

NUMBER OF CASES IN OVERLAY ZONE	NUMBER OF BAYS PROVIDED	NUMBER OF BAYS REQUIRED	DIFFERENCE
20	8 619	0	8 619

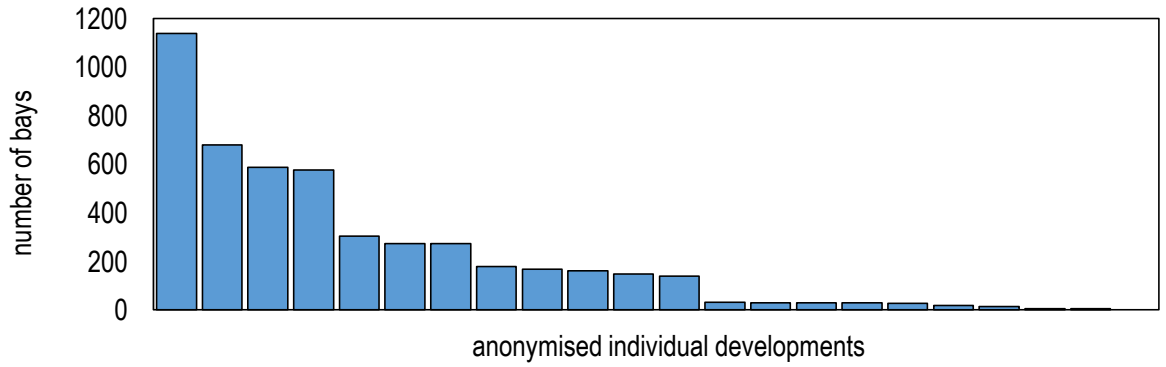

Figure 5: Number of parking bays provided by developments in the CBD

The over-provision in the CBD of 8 619 bays results in an opportunity loss of 161 606 m^2 (16,2 ha) of developable area. This could be an over-estimation, as many of these bays are basement parking. However, even reducing this figure by a factor still results in a significant opportunity cost. What is also hidden in these results is the number of cases where only minimal parking has been provided.

5.4 Geographical Spread of Parking Bays 'Saved'

Figure 6 maps the geographical spread of parking bays 'saved'. Some spatial patterns emerge: the nature of the particular land use adjacent to that node determined the uptake. Clearly, centres with significant student accommodation made the greatest savings. The other areas with significant savings were in the inner city adjacent to the Cape Town CBD; and the industrial area at Tygerberg station. These centres are on existing rail lines, with the inner-city area also benefiting from significant road-based public transport. From a land development perspective, Woodstock to Rondebosch (student accommodation area) has high (or rapidly rising) land values, putting pressure on developers to maximize the productivity of their land.

Other areas with significant savings are located along the northern and southern transport corridors. However, all areas served by the MyCiTi Phase 1 (Table View, Milnerton, Century City and Paarden Eiland) showed significant savings. This included both old, established areas and the growth area of Table View, Parklands, and Dunoon.

Belhar was the only centre where there was significant over-provision, attributed to industrial developments.

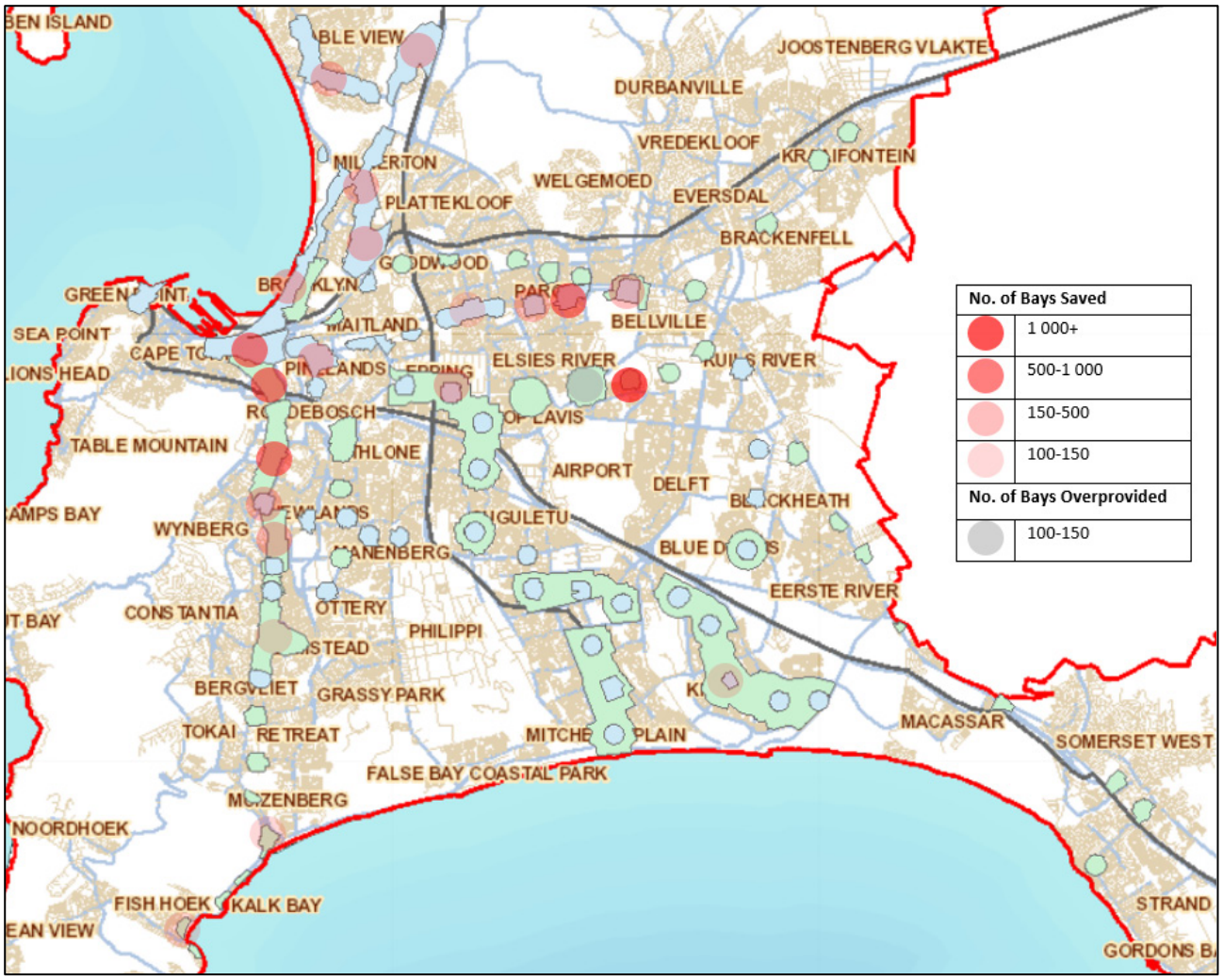

Figure 6: Centres with the greatest parking 'savings' (and oversupply) against the standard requirement

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 The PT Areas Mechanism Has Contributed to TOD

This study provides quantitative evidence that parking provision can be used to support the restructuring of the city over time, in support of public transport and of transit-oriented development. In particular, a total of 9 662 bays have been saved in PT1 and PT2 areas (i.e., 181 163 m^2 or 18,1 ha). However, with the over-provision in the CBD, the under-provision is reduced to a nett 1 043 bays, or 19 556 m^2 (1,9 ha) of developable area saved, potentially available for productive use.

6.2 Recommendations

The following recommendations to the national government could flow from this study:

- Create enabling legislation for delinking parking provision from land uses, to enable shared parking provision.
- In the face of limited improved public transport improvements, develop policy to encourage alternative measures to reduce parking demand through travel demand management, such as green travel plans.

- Review the assumptions behind the current minimum parking standards, particularly for trip attractors.

Globally, as the role of many CBDs and urban centres is being redefined by the changes in work and travel imposed by the COVID-19 pandemic, this is an opportune time for city governments to enable reduced parking provision, as part of locking in the gains made in travel behaviour change, in support of less car-centric cites, towards more people- and planet-friendly ones.

6.3 Reflection

There have been significant events since the study period. As mentioned earlier, a further iteration of PT areas was implemented which included the road-based public transport services of minibus-taxis, conventional buses and MyCiTi feeder services, significantly increasing the PT area footprint, and extending it into new areas. This elicited a backlash from some areas which were already experiencing a high demand for on-street parking from residents and visitors. The other concern in choice suburbs was that it enables residential developments with no parking, which by implication (in the South African context) will accommodate people of low to moderate incomes.

On investigation, it was discovered that the mechanism had not been properly adopted to begin with, in that the plan (a map) was not advertised for public comment, or recorded as an annexure in the DMS. A moratorium was therefore placed on the PT areas pending the completion of a public participation process and formal Council (political) adoption of the resultant updated mechanism. This process is ongoing at the time of writing. The future of PT areas in Cape Town is therefore unknown. This paper may be too late to influence the outcome. But valuable lessons have been learnt, which Cape Town and other cities could draw on as they look for mechanisms to support TOD and spatial transformation.

7. ACKNOWLEDGMENTS

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